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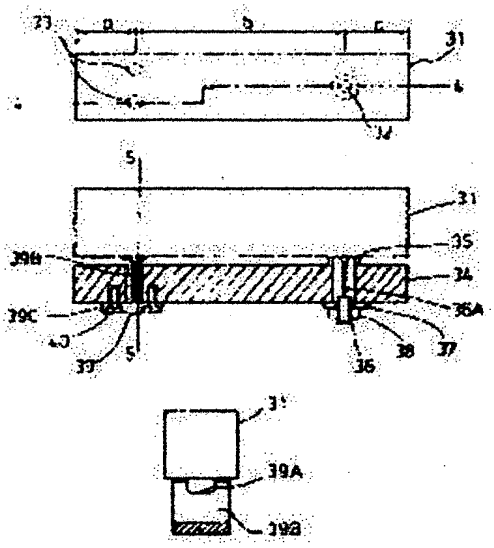
(54) ATTACHING STRUCTURE FOR PRECISE MIRROR

(57)Abstract:

PURPOSE: To attach a mirror while keeping the precision of the mirror itself, by fixing one end part of the precise mirror to a reference face by a prescribed attaching jig and supporting the mirror through a flexible member at three points.

CONSTITUTION: A mirror 31 having ≥31 ratio of length to width is supported at three points, namely, one reference position 32 and two fulcrum positions 33. An inside holed reference face 35 (it is necessary that the area of the reference face 35 is ≤10% projection area in the vertical direction of the mirror to the attaching face) is provided on a table 34 in the reference position 32, and the mirror 31 is placed on the reference face 35. One end of an attachment 36 having a wire-shaped flexible member 36A is adhered to the mirror with an adhesive in the inside hole of the reference face, and the other end of the attachment 36 is fastened to the table 34 by a washer 37 and a nut 38. At fulcrum positions 33, the mirror 31 is adhered to separated parts of a flat spring part 39B which has one end separated by a notch 39A, and a flange 39C is fixed by setscrews 34 in the other end. In this supporting at three points, the influence of deformation due to fastening and hardening of the adhesive is small, and the precision of the mirror itself is kept.



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CLAIMS

[Claim(s)]
[Claim 1] The hologram for collimation which collimates semiconductor laser light (10), The polarization separation hologram for carrying out polarization separation of the light collimated by this hologram for collimation (10) (11), While arranging the convergence hologram for detection (14) for completing reflective signal light as an optical detector (15), and ********** in the front face of light guide section material (9) By this light guide section material (9), the hologram (10) -> polarization separation hologram for semiconductor laser (LD) -> collimation (11), Convergence hologram (14) for polarization separation hologram (11) -> detection -> an optical detector (15), In order to make ****** form and to make polarization separation light into the circular polarization of light on a polarization separation hologram (11) 1/4 wavelength plate (12) is piled up. ** The object convergence hologram (13) for converging circular polarization of light light on 1/4 wavelength plate (12) is piled up. The light which carried out outgoing radiation from semiconductor laser (LD) is drawn in order of the hologram (10) -> polarization separation hologram for semiconductor laser (LD) -> collimation (11). The optical pickup characterized by having arranged each element so that the reflective signal light from a record medium (6) may be drawn in order of the convergence hologram (14) -> optical detector for polarization separation hologram (11) -> detection (15).

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Summary of the Invention]
The irradiation section to a semiconductor laser -> record medium -> the optical path of the optical detection section is constituted from transparent light guide section material, between the irradiation section, the light source, and ******** is detached, and arrangement is made possible, and an optical element is created by the hologram, and small and lightweight-ization are attained by installing in direct light guide section material.
[Industrial Application]
In laser disc equipment, when reading information in disk media optically, high-speed movement of the optical system for optical pickups is carried out, and read is performed. Therefore, since the access time is shortened or equipment is miniaturized as an optical pickup, a thing lightweight small is required. In order to attain low-pricing in response to such a demand, things for which a hologram is used instead of, such as the conventional lens, are studied. this invention relates to the optical pickup using such a hologram.
[Description of the Prior Art]
A view 9 is a side elevation of an optical pickup using the conventional optical lens. After the light which carried out outgoing radiation from semiconductor laser LD is changed into parallel light with a collimate lens 1, it is irradiated by a rat tail and disk media 6 with an objective lens 5 through the optical path of perfect circle amendment prism 2 -> polarization-beam-splitter 3 -> 1/4 wavelength plate 4. And the reflected light which read information passes along the optical path of the objective lens 5 -> 1/4 wavelength-plate 4 -> polarization-beam-splitter 3 -> condenser lens 7 -> optical detector 8, and is changed into an electrical signal by the optical detector 8.
[Problem(s) to be Solved by the Invention]
Thus, in the conventional optical pickup, many group lenses etc. had to be used, and on a large scale [an optical pickup], since the weight is large, trouble has been caused to the high-speed drive. Moreover, since many optical lenses must be justified spatially and must be arranged, an assembly is difficult.
Then, although the research using the diffraction effect of light of a lightweight and small hologram lens is made, a hologram lens with such an advantage is used for this invention, it realizes an optical pickup, attains small lightweight-ization of an optical pickup especially, and it is to enable facilitation of assembly adjustment while offering the optical pickup suitable for the high-speed drive.
[Means for Solving the Problem]
A view 1 is a side elevation explaining the basic principle of the optical pickup by this invention. 9 is transparent light guide section material, such as glass and plastics, and serves as the loading function of each optical element, and the guide function of light. Each optical element is arranged and the light to which semiconductor laser and 10 are polarization separation holograms, and LD carried out incidence for the hologram for collimation and 11 to the light guide section material 9 from semiconductor laser LD is prepared on the light guide section material 9 so that it may be collimated at the same time it is led to the hologram 10 for collimation and reflects, and total

reflection of the inside of the light guide section material 9 may be carried out and it may be led to the polarization separation hologram 11. Moreover, on the polarization separation hologram 11, 1/4 wavelength plate 12 piles up, and it is **. The object hologram 13 for convergence has piled up on 1/4 wavelength plate 12. A beam is irradiated on a record medium 6 by the object hologram 13, and the reflected light is drawn into the light guide section material 9 through the polarization separation hologram 11. Although this detection signal light carries out total reflection of the inside of the light guide section material 9, the convergence hologram 14 for detection is arranged in the position which can carry out incidence of this total reflection light, and the optical detector 15 is arranged in the position which counters this hologram 14 so that the light which it converged by the convergence hologram 14 for detection can be detected.

[Function]

The emission light which carried out outgoing radiation from semiconductor laser LD is collimated by the hologram 10 for collimation in an opposite position, and total reflection is carried out into the light guide section material 9. And total reflection is repeated in the light guide section material 9, it arrives at polarization separation hologram 11 position, and incidence is carried out to this polarization separation hologram 11. and -- After being changed into the circular polarization of light by 1/4 wavelength plate 12, it converges by the object hologram 13 and a record medium 6 irradiates. The signal light reflected from the record medium 6 is drawn in the path of the object hologram 13 -> 1/4 wavelength-plate 12 -> polarization separation hologram 11, and carries out incidence into the light guide section material 9 through the polarization separation hologram 11. And total reflection is repeated by the light guide section material 9, the convergence hologram 14 for detection is reached, and it converges on the optical detector 15 of an opposite position, and is changed into an electrical signal.

Thus, since light spreads through the light guide section material 9 between a semiconductor laser LD position, the optical detection section, and the irradiation section to a record medium, between both is detached enough and it can arrange it. Consequently, an optical semiconductor laser LD and detection section side can be made fixation, can carry out minute movement only of the irradiation section 24 to a record medium 6, and can also perform the fine control and focusing of a reading station.

[Example]

Next, an example explains how the optical pickup by this invention is materialized in practice. A view 2 is a partial cross-section side elevation showing the example of the optical pickup by this invention. The light guide section material 9 serves as an optical path of nothing and an optical pickup in the shape of a tabular or a square bar. The total reflection in the interface of the light guide section material 9 and air is used, the light from semiconductor laser LD passes along the inside of the light guide section material 9, and it is guided to optical disk 6 position, and irradiates as a convergence beam to an optical disk 6 top, and the reflected light from an optical disk is further led to the optical detection section. Like the glass of plus sticks, such as an acrylic, and BK7 grade in the quality of the material, a transparent thing is used to semiconductor laser light.

Total reflection angle thetaT is sin thetaT=1/n (n= refractive index).

As shown in drawing, an optical path is set up, so that it may become thetaT=41.8 degree by n= 1.5 and total reflection angle thetaT may become more than this angle. Consequently, the light reflected by the hologram 10 for collimation reaches the polarization separation hologram 11 through the optical path 16 shown as a solid line, and the reflective signal light which carried out incidence into the light guide section material 9 further reaches the convergence hologram 14 for detection through the optical path 17 shown with a dashed line. This light guide section material 9 also has the function in which a total reflection angle removes the scattered light more than theta.

As outgoing radiation of the emission light of hundreds of micrometer angle is carried out, and it joins to the light guide section material 9 through adhesives directly or it is shown in a view 3, you may attach semiconductor laser LD carried in the light guide section material 9 through the block 18 for thermolysis.

Although it is for changing to parallel light the emission light which carried out outgoing radiation

from semiconductor laser LD, the hologram 10 for collimation is a reflected type hologram in order to carry out total reflection of the parallel light into the light guide section material 9. When using a phase type hologram, as shown in a view 4, it is created by irradiating the emission light 19 and a slanting parallel light from both sides at the hologram record medium 21. Moreover, as shown in the 5th view , direct relief may be formed in the light guide section material 9, and the reflective film 22 may be formed by the vacuum plating of aluminium etc. on this, and you may obtain a reflection hologram. In addition, the light collimated by the hologram 10 for collimation does not necessarily need to be an exact parallel light, and the light emitted gradually is sufficient as it.
The polarization separation hologram 11 diffracts S polarization in a surface relief type hologram, and P polarization has the function made to penetrate. A view 6 is a side elevation showing an operation of this polarization separation hologram 11. P polarization which a (b) is the example which used P polarization and has been spread from the hologram 10 for collimation penetrates the polarization separation hologram 11, and is a degree. It is changed into the circular polarization of light by 1/4 wavelength plate 12. Moreover, it becomes S polarization by the reflective signal light from a record medium 6, and 1/4 wavelength plate 12, and incidence is carried out and it diffracts in the light guide section material 9. S polarization spread from the hologram 10 for collimation like a (b) when S polarization is used is a degree by the polarization separation hologram 11. It diffracts in 1/4 wavelength plate 12. Moreover, by the reflective signal origin from a record medium 6, and 1/4 wavelength plate 12, it becomes P polarization, and incidence is carried out, and it is penetrated in the light guide section material 9 as it is. In addition, the case of P polarization is assumed and it is shown by the 1st view and the 2nd view .

1/4 wavelength plate 12 changes into P polarization or S polarization the circular polarization of light which changed into the circular polarization of light the light which carries out incidence from the polarization separation hologram 11, and carried out incidence to the object hologram 13, and was reflected with the record medium 6. The object hologram 13 converges parallel light, and extracts it to an about 1-micrometer beam on an optical disk 6, and a direction-hologram — any polarization can be converged like a phase hologram — is used for it. In addition, an isotropic hologram is possible also for a surface relief hologram, and this may be used.
As for the convergence hologram 14 for detection, it is good to make it generate the light which reflects and condenses parallel light spread in the path which shows the inside of the light guide section material 9 with a dashed line at an optical detector 15, and generally had aberration. Although the creating method is the same as the method explained in the view 4 and the view 5, it can obtain a light required for focusing and a tracking servo by giving aberration to one side of a spherical wave or an parallel wave.
An optical detector 15 detects the signal light which reflected in respect of the disk and has spread the inside of the light guide section material 9, and changes it into an electrical signal, tracking and a focusing servo signal are obtained, and a quadrisection detector is used.
In addition, as for each hologram, it is good on the light guide section material 9 to carry out a laminating.
The example which materialized the optical pickup of this invention as an object for the read of an optical disk is shown in a view 7 and an octavus view . Light guide section material is an arm 91, and, as for the view 7, semiconductor laser LD and the optical detector 15 are arranged in the position of the axis-of-rotation 23 approach. And the irradiation section 24 which consists at a nose of cam of the polarization separation hologram 11, 1/4 wavelength plate 12, and the object hologram 13 of a view 2 is **** eclipse ******. The optical path to which the reflective signal light detected in the optical path to which the light which carried out outgoing radiation from semiconductor laser LD spreads the inside of the arm formula light guide section material 91, and results in the polarization separation hologram of the irradiation section 24, and the irradiation section 24 spreads the inside of the arm formula light guide section material 91 from a polarization separation hologram, and results in an optical detector 15 is as the view 2 having explained.
The circumference of ** and the irradiation section 24 is equipped with the coil 25 for the

directions of focusing with the enlarged view of the irradiation section 24, and, as for a (b), the side is equipped with the coil 26 for the directions of tracking. Moreover, an interval is set, permanent magnets 27 and 27 are arranged, the coil 26 for tracking is countered and the permanent magnet 28 is arranged near the irradiation section 24. Therefore, if it energizes in the direction coil 25 of focusing, by the magnetism which acts among permanent magnets 27 and 27, the irradiation section 24 will displace in the direction of an optical disk, and focusing will be performed. Moreover, if it energizes in the direction coil 26 of tracking, by the magnetism which acts between permanent magnets 28, the irradiation section 24 will move in the direction of tracking, and fine control of the direction of tracking will be performed.

Even if the axis-of-rotation 23 side is in a fixed state, since an arm 91 may bend somewhat, as mentioned above, by energization to coils 25 and 26, the arm formula light guide section material 91 can carry out the minute variation rate of the irradiation section 24 quickly, and can perform focusing and tracking.

An octavus view is the example which replaced with the arm formula light guide section material 91, and used light guide section material as the disk 92. Therefore, semiconductor laser LD, an optical detector 15, and the irradiation section 24 are carried in the disk 92. And the optical path of the semiconductor laser LD-> irradiation section 24 -> optical detector 15 is formed with the transparent disk 92. In addition, when, as for focusing, the axis of rotation 29 of a disk 92 moves up and down, tracking is performed because a disk 92 rotates around the axis of rotation 29.

[Effect of the Invention]

Since each element which results in the irradiation to a record medium and detection of reflective signal light is carried in one light guide section material and the element for collimation, convergence, polarization, etc. is constituted from generating of a read beam by the hologram according to this invention as mentioned above, as a whole, an optical pickup turns small and lightweight and is suitable for rapid access. Moreover, compared with assembling justifying many optical lenses in three dimensions, since it becomes a thin shape configuration, and it is suitable for mounting in a narrow part and each part article is prepared on light guide section material, manufacture becomes very easy. Since the irradiation section to a record medium is arranged in the position distant from semiconductor laser and the optical detection section and it can connect optically by light guide section material, fine control of focusing and the direction of tracking can be performed at high speed by making only the irradiation section at a nose of cam move slightly at high speed.

[Translation done.]

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⑤4精密鏡の取付構造

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⑦2出 願 昭56(1981)11月10日
⑦2発 明 者 鈴木章

明 細 書

1.発明の名称

精密鏡の取付構造

2.特許請求の範囲

1)長さ対巾或いは高さとの比が3以上の精密鏡の機械構成部品の取付において、前記精密鏡のほぼ一側端部を前記精密鏡の取付面への垂直方向の投影面積の10%以下の面積を有する基準面で固定し、その他側を前記精密鏡の長手方向に対する剛性をその直交方向に対する剛性の1/8より小さく構成された取付具Bによつて固定した精密鏡の取付構造。

2)精密鏡の一側の固定を、針金状の可撓部を有しその一端に取付面を他端に締具を有する取付具Aとし。前記取付面で前記精密鏡に接着し前記精密鏡の取付面近傍を機械構成部品の基準面に当接し、かつ前記取付具Aの締具により前記精密鏡の一端と前記機械構成部品とを固定したことを特徴とする特許請求の範囲第1項記載の精密鏡の取付構造。

3.発明の詳細な説明

本発明はレーザ鏡等の精密鏡を機械構成部品に取付けるときの構造に関する。

精密鏡の使用形態の一つとして電子ビーム描画装置を例にとつて第1図および第2図により述べる。機械構成部品としてのテーブル11上にはカセット押え工具12によりマスク13を保持したカセット14が着脱可能に載置されており、テーブル11の2つの端部側には直交形レーザ鏡15が取付けられている。しかしてテーブル11はX方向案内16によりテーブル中17上をX方向に移動され、テーブル中17はY方向案内18によりテーブル下19上をY方向に移動されることにより、XY方向に移動可能である。そしてその移動量はレーザ光源20から発したレーザ光21が、干渉計22を経てレーザ鏡15に当つた後干渉計22に戻り、その干渉状態からレシーバ23により検出測定される。

本発明は前述したレーザ鏡15等の取付構造についてなされたもので、一般に鏡はガラス等を磨いて製作されており、その平面度は$\frac{\lambda}{20}$（λは平面度測定用光の波長で0.633μm）程度は製造可能でありかかる鏡は精密鏡とよばれ、要求によつては石英で製造することも可能でこの場合は線膨張係数は非常に小さい。一方機械構成部品は鉄や鋼とかステンレス鋼或いはアルミニウム等であつて、これに高平面度の精密鏡（以下単に鏡という）を取付けるには取付面を高い平面度にし、その上に鏡を機械的に押えるか或いは接着剤により取付けていた。

この場合の問題点は、金属部品の高精度加工で加工熱の影響を受けることや、機械構成部品として機能上の要求から形状が複雑になる等の理由から、鏡と同程度の精度にすることは困難であつて歪んだ面に取付けられた鏡は変形させられ当初の精度を保持できなかつた。また接着剤により取付けたものは接着剤硬化時の収縮により鏡に歪を与えていた。鏡を機械的取付或いは接着剤による取付の何れの方法であつても、金属とガラス等熱膨張係数の異なる材質を取付けているので、温度が少少変化してもバイメタル的挙動によつて変形を起し当初は精度良く取付けても温度変化に会うと精度劣化を発生していた。

本発明はかかる観点からなされたものでその目的は、特に細長く締付力によつて曲つたり捩れ易い鏡に対する鏡の取付構造を提供することにある。

以下本発明について一実施例を示した第3図ないし第5図について説明する。長さ対巾の比が少くとも3以上ある鏡31は一つの基準位置32と2つの支点位置33の計3点で支持され、各点の長さに対する距離a b cの比は自重による変形の最小値が望ましいが、自重による曲りが少いときは特に制限はない。基準位置32において第4図に示すように、テーブル等の機械構成部品34には内側が穴になつているリング状の基準面35（鏡の取付面への垂直方向の投影面積の10%以下であること必要）が設けてあり、鏡31は基準面35上面に載置されている。基準面35の内側の穴には針金状の可撓部36Aを有する取付具A36の一端が接着剤により鏡31に接着されており、取付具A36の他端側はネジになつて座金37とナット38によりテーブル34に締付けられている。一方支点位置33には第4図および第5図に示すように、一端を切欠き39Aにより2つに分離しこの切欠き39Aに続く板状の板バネ部39Bを有する取付具B39があり、この切欠き部39Aにより分離された部分の上面に鏡31を載置し、鏡31の長手方向で上記した載置部分の両側を接着剤で接着する。取付具B39は下端のフランジ39Cを止ネジ40によりテーブル34に固定しており、板バネ部39Bはテーブル34の長穴内にある。従つて鏡31は長手方向に対し可撓性を有し長手直角方向には剛性を有し、両者の剛性の比はほぼ1：5である。

前述した構成は基本的には3点支持であつて、鏡に対し締付力や接着剤の硬化時の変形による影響は極小になつている。これを取付具A36と鏡31の接着面について見ると、取付具A36は極小面積で鏡31と接しており、鏡31自身の剛性は接着剤の硬化時変形の力より大きいので変形の影響はない。なお3点支持といつても実質的には面積があり、特に基準面35に対して取付具A36により鏡31を引付けているので、リング状の基準面35の右或いは左（図上）の肩があいた状態で締付けると、取付具B39との間にモーメントが発生し鏡31を曲げる力となつて好ましくない。このため支持点3ケ所は全体的に垂力平面でかつ高さが揃つている必要がある。また基準面35は小さい方が前記したモーメントは小さく、かつ取付具A36による引張力も鏡31が動かない範囲で小さい方がよい。

なお前記説明では取付具B39の鏡31への接合面は2分した例を示したが、比較的形状の小さいときは2分しなくてもよい。以上は鏡を機械構成部品に取付け、取外しできる構造の例で、一般には、この様な鏡は、ただ取りつければ良いのではなく機械構造物との相対位置を測定調整し、最終的に固定する必要があるので、この様な構造が有効であり、またメンテナンスの面からもこの様な取外しできる方が都合よい。しかし作業のやり方によつ

ては直接接着する方法もある。

第6図は本発明の他の実施例でこの例では鏡31の一端部がテーブル51に直接接着している。テーブル51の一端には基準台52を設けこの上面に鏡31を接着剤により固定する。鏡31の他端は可撓部53Aを有する取付具B53を接着剤により接着し、そのフランジ53Bをネジ54によりテーブル51に締付ける。なお基準台52の紙面垂直方向の巾は取付具B53との間に生ずる可能性のある曲げ応力などによつて鏡が変形されることをさけるために可能な限り小さい方がよい。また鏡31をテーブル51へ平行に載置するため取付具B53側にも補助基準台54を置くのが好ましいが、取付具B53と干渉させないことが必要で、このためには補助基準台54をテーブル51とは別個にして、取付具B53をネジ54により締付けた後は補助基準台54を取外すようにすることが好ましい。

第7図も本発明の他の実施例でこの例では直交形の鏡を示している。鏡61は交点62で交る鏡61Aと61Bからなり、1個の基準位置63と2つの支点位置64および65を有する。基準位置63では第4図に示した取付具A36により鏡61はテーブル（図示せず）に固定されており、2つの支点位置64と65では第4図に示した取付具B39により鏡61はテーブルに固定されている。従つて支点位置64ではX方向変位に対し可撓性を有しY方向変位に対し剛性を有する。一方支点位置65ではY方向変位に対し可撓性を有しX方向変位に対し剛性を有する。

本発明の鏡の取付構造は前述したように構成したので、細長い形状で曲つたり振れ易い鏡をテーブル等の機械構成部品に、鏡自身の精度を保持して取付けることが可能になつた。このため鏡の持つ能力を十分に発揮することが可能になる効果を本発明は有するものである。

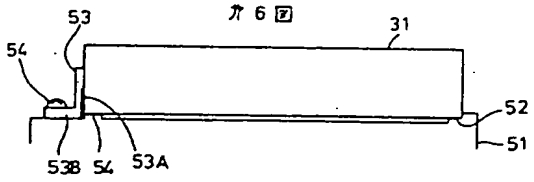
4.図面の簡単な説明

第1図および第2図は鏡を取付けた装置の一例を示し第1図は平面図、第2図は側面図、第3図ないし第5図は本発明の一実施例を示し第3図は平面図、第4図は第3図の4-4線断面図、第5図は第4図の5-5線断面図、第6図は本発明の他の実施例の側面図、第7図は本発明のさらに他の実施例の平面図である。

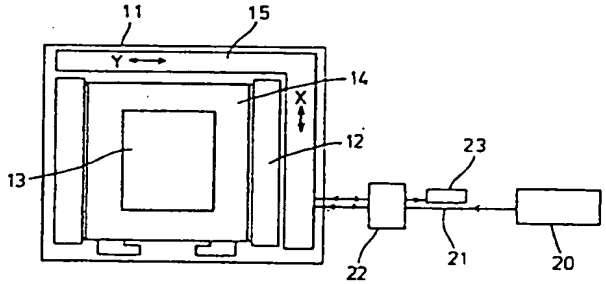
31，61…精密鏡、34，51…機械構成部品（テーブル）、35，63…基準面、36…取付具A、39…取付具B。

出願人　　東芝機械株式会社

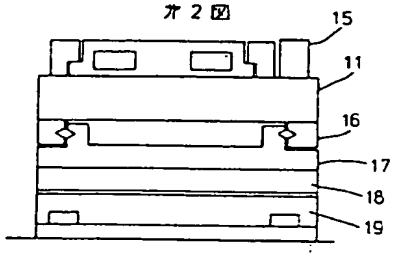
第6図



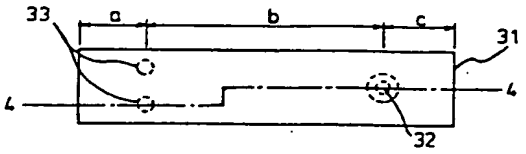
第1図



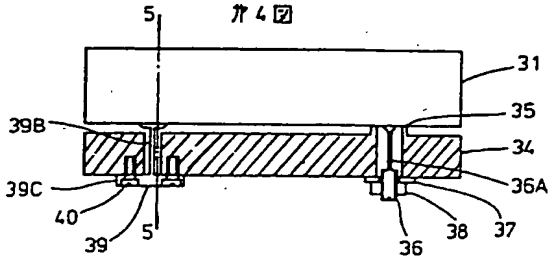
第2図



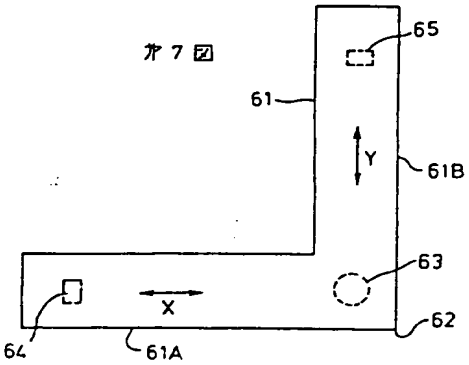
第3図



第4図



第7図



第5図